ABSTRACT

There are considerable inconsistencies in the literature concerning the relationship between age and depression. Recently, however, two independent studies in the U.S. have shown that the distribution is U-shaped with the lowest reported levels of depression at ages 45-49. Three reasons for past inconsistencies are identified and addressed using the 1994 National Population Health Survey by Statistics Canada. Using both a distress scale and a diagnostic measure, a substantially different relationship was found. The prevalence of distress decreased steadily with age until about 65, with only a slight increase afterwards for both males and females. After the introduction of several sociodemographic covariates, however, this relationship was clearly negative. These findings are discussed in terms of future research questions.

ABRÉGÉ

Il existe des incohérences considérables dans la littérature au sujet de la relation entre l'âge et la dépression. Récemment, toutefois, deux études indépendantes aux É.-U. ont montré que la distribution est de type parabolique et que les taux les plus faibles de dépression se situent entre 45 et 49 ans. Trois raisons expliquant les incohérences passées ont été identifiées et prises en compte à l'aide de l'Enquête nationale sur la santé de la population de 1994 de Statistique Canada. En recourant à une échelle de mesure de la détresse et à une mesure diagnostique, on a fait apparaître une relation substantiellement différente. La prévalence de la détresse décroissait régulièrement avec l'âge jusqu'à 65 ans environ, avec seulement une légère remontée après tant pour les hommes que pour les femmes. Toutefois, après introduction de plusieurs covariables socio-démographiques, cette relation est apparue clairement négative. Les résultats sont discutés du point de vue des futurs travaux de recherche à entreprendre.

Age and Depression in a Nationally Representative Sample of Canadians: A Preliminary Look at the National Population Health Survey

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Whether the prevalence of depression decreases or increases with age remains unclear.¹⁻¹⁷ At least three reasons have been offered for these discrepant findings. First, many of the studies addressing the issue either analyze samples that are too small¹⁷ or samples that are truncated at or before 65 years of age.¹⁷ Such limitations in the data make it difficult, if not impossible, to assess the relationship between age and depression across the entire life span. Second, differences in the age-depression relationship may be an artifact of the outcome measure used. For example, diagnostic measures estimate much lower rates of depression than distress scales.^{1,16,18} This may be due to either a diagnostic bias¹⁹ or a confounding of physical health complaints with mental health status.^{19,20} Finally, many of these studies do not take into account how the relationship between age and depression may vary by sex,^{2,21,22} and other sociodemographic covariates such as marital status,^{3,23,24} income,^{3,23,24} urban residence,²⁴⁻²⁶ and ethnic origin.^{23,27}

Addressing many of these concerns, two recent studies in the United States suggest that the age-depression relationship is

clearly U-shaped, with the lowest predicted point at about 45 years of age.^{1,2} One question of interest for public health in Canada is whether or not the U-shaped distribution also describes the relationship between age and depression among Canadians. Moreover, we may also ask whether this relationship remains consistent after all the factors mentioned earlier have been addressed. Although some recent work demonstrates that the prevalence of depression decreases with age in Canada,²⁸ there has been no thorough examination of the age-depression relationship using a large, nationally representative sample of Canadians. The 1994 National Population Health Study (NPHS) provides an opportunity to examine this relationship.

METHODS

The following analyses were conducted using the NPHS by Statistics Canada. (For a complete description of the methodology, consult the NPHS Public Use Microdata File Documentation.²⁹) Using a multi-stage, stratified, random sampling procedure, 19,600 households across Canada were surveyed in which one person was selected to provide detailed personal information for the longitudinal component of the survey. People living in Indian reserves, military bases, institutions, and some remote areas in Ontario and Quebec were excluded.²⁹ Of the 18,342 possible respondents aged 12 or older, 17,626 participated, resulting in a selected-person response rate of 96%. Because the average age of onset of mental illness is 16 years,^{23,24} respondents aged 12 to 14 (n=637) were excluded, which reduced the total sample to 16,989 (representative of a population of 22,622,479). All analyses

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- Support provided to Terrance J. Wade by a Fellowship from the Ontario Ministry of Health, Health Research Personnel Development Program, and to John Cairney by a Fellowship from the Social Science and Humanities Research Council of Canada. Financial assistance was also provided by the Centre for Health and Well-Being.
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were computed using the standardized weighting scheme suggested by Statistics Canada.²⁹

Dependent variables

Generalized distress is a derived variable measured on a scale consisting of six items and providing one-month prevalence rates of non-specific distress; higher scores indicate greater distress (Appendix 1). Statistics Canada selected these six items to include in the NPHS from a nonspecific psychological distress scale composed of 45 items (15 core and 30 additional items) developed at the University of Michigan.²⁹ The Michigan scale was derived from over 500 items originating from 22 previous distress scales using Item Response Theory to maximize item clarity and to be equally reliable across important subsamples of the U.S. population (personal communication: Dr. R. Kessler, University of Michigan, 1994). The internal reliability of this six-item scale reported by Statistics Canada was $\alpha=0.7935$.

The major depressive episode (MDE) variable is derived from the University of Michigan–Composite International Diagnostic Interview – Short Form (UM-CIDI), a major depressive diagnostic instrument that provides one-year population prevalence rates of diagnosable depression (Appendix 2). This instrument is a shortened version of the original CIDI and UM-CIDI, which assigns a diagnosis of depressed mood on the basis of criteria from the DSM-III-R and the ICD-10. The diagnostic instrument predicted the presence of an MDE from two central dimensions of depression: feeling sad, blue, or depressed; losing interest in most things. If respondents reported experiencing either dimension at least most of the day, almost every day, for a period of two weeks in the previous 12 months, they were prompted to answer “yes” or “no” to a series of symptoms. For respondents answering “yes” to at least three symptoms there was a probability of an MDE of greater than 0.50 and, following convention, they were classified as having an MDE (personal communication: Dr. R. Kessler, University of Michigan, 1994).

Sociodemographic variables

Age was collapsed into five-year intervals from 15 to over 80 years of age.

Appendix 1 Generalized Distress Scale Used in the 1994 National Population Health Survey, Statistics Canada*

Generalized Distress

During the past month, about how often did you feel:

1. ... so sad that nothing could cheer you up? (Read list. Mark one only.)
☐ All of the time ☐ Most of the time ☐ Some of the time ☐ A little of the time ☐ None of the time DK†
2. ... nervous? (Read list. Mark one only.)
☐ All of the time ☐ Most of the time ☐ Some of the time ☐ A little of the time ☐ None of the time DK
3. ... restless or fidgety? (Read list. Mark one only.)
☐ All of the time ☐ Most of the time ☐ Some of the time ☐ A little of the time ☐ None of the time DK
4. ... hopeless? (Read list. Mark one only.)
☐ All of the time ☐ Most of the time ☐ Some of the time ☐ A little of the time ☐ None of the time DK
5. ... worthless? (Read list. Mark one only.)
☐ All of the time ☐ Most of the time ☐ Some of the time ☐ A little of the time ☐ None of the time DK
6. During the past month, about how often did you feel that everything was an effort? (Read list. Mark one only.)
☐ All of the time ☐ Most of the time ☐ Some of the time ☐ A little of the time ☐ None of the time DK

* Questions taken from the NPHS questionnaire. Question numbers were changed for the sake of brevity.

† DK=Don't know

TABLE I
Scores on Generalized Distress and Major Depressive Episode (MDE) for
Males and Females (n = 7432 for males and n = 9253 for females)

Variable	Males Mean (sd)	Females Mean (sd)
Generalized distress	3.11 (3.21)	3.81* (3.51)
Major depressive episode	proportion 0.053	proportion 0.095*

* Significantly higher than the male value, $p \leq 0.001$

TABLE II
Sociodemographic Correlates for Generalized Distress and
Major Depressive Disorder (MDE) for Males and Females
(n = 7432 for males and n = 9253 for females)

	Generalized Distress Males (F-test)	Females (F-test)	Major Depressive Episode Males (χ^2)	Females (χ^2)
Age	23.01*	18.62*	53.26*	100.15*
Marital status	95.59*	88.36*	86.41*	51.56*
Education	4.77*	15.42*	6.08	32.97*
Income adequacy	41.52*	50.27*	27.91*	7.56*
Province of residence	5.51*	11.32*	12.82*	15.70
Immigrant status	1.07	0.14	14.04*	1.84

* $p \leq 0.001$

Marital status was categorized by Statistics Canada to discriminate between married, single, and other (separated, divorced, or widowed). Education was broken down into six levels of increasing amounts of schooling. Income

was composed of five levels indicating increasing income and was calculated by adjusting data on total household income by household size. The criterion for each category was based on Statistics Canada low income cutoffs.^{30,31} The

Appendix 2

Major Depressive Episode Diagnostic Interview (UM-CIDI-SHORT FORM)
Used in the 1994 National Population Health Survey, Statistics Canada*

Major Depressive Episode (MDE)

Dimension 1 - Feeling Sad, Blue, or Depressed

1. During the past 12 months, was there ever a time when you felt sad, blue, or depressed for 2 weeks or more in a row? (Yes—go to 2 // No—go to 4)
For the next few questions, please think of the 2-week period during the past 12 months when these feelings were worst.
2. During that time how long did these feelings usually last? (Read list. Mark one only.)
(All day long/Most of the day—go to 3 // About half of the day/Less than half the day—go to 4)
3. How often did you feel this way during those 2 weeks?
(Every day/Almost every day—go to i // Less often—go to 4)

Symptoms

- i. During those 2 weeks did you lose interest in most things? (Yes/No)
- ii/ix. Did you feel tired out or low on energy all of the time? (Yes/No)
- iii/x. Did you gain weight, lose weight or stay about the same?
(Gained weight/Lost weight/Stayed about the same // Was on a diet—go to iv/xi)
About how much did you (gain/lose)? [Note: a change of at least 10 pounds (4.5 kgs) was required for symptom to be counted]
- iv/xi. Did you have more trouble falling asleep than you usually do? (Yes // No—go to v/xii)
How often did that happen? (Every night/Nearly every night/Less often) [Note: trouble sleeping every night or nearly every night was required for symptom to be counted]
- v/xii. Did you have a lot more trouble concentrating than usual? (Yes/No)
- vi/xiii. At these times, people sometimes feel down on themselves, no good, or worthless. Did you feel this way? (Yes/No)
- vii/xiv. Did you think a lot about death - either your own, someone else's, or death in general? (Yes/No)

Dimension 2 - Losing interest in most things

4. During the past 12 months, was there ever a time lasting 2 weeks or more when you lost interest in most things like hobbies, work, or activities that usually give you pleasure? (Yes—go to 5 // No—end)
For the next few questions, please think of the 2-week period during the past 12 months when you had the most complete loss of interest in things.
5. During that 2-week period, how long did the loss of interest usually last?
(All day long/Most of the day—go to 6 // About half of the day/Less than half the day—end)
6. How often did you feel this way during those 2 weeks?
(Every day/Almost every day—go to ix // Less often—end)

* Questions taken from the NPHS questionnaire. Question numbers were changed for the sake of brevity.

province variable referred to the province of residence at the time of interview. Because of the limitations and restrictions of the NPHS public data release, urban/rural residency and race/ethnicity, which were previously identified as important covariates, could not be included in the analysis. Immigrant status was included to indicate whether the respondent was born outside of Canada. Age, education, and income were analyzed as continuous measures in regression analyses, and all others were treated as nominal.

RESULTS

Table I presents the average distress score and MDE prevalence rates for males and females. Consistent with the results of previous studies, females had significantly higher distress scores and were more likely to have experienced an MDE than males. Accordingly, we examined the age-depression relationship separately for males and females.

Figure 1 illustrates the distribution of generalized distress and MDE across all age groups for both males and females. The

relationship between age and depression, on either measure, shows a downward trend for most of the life course. As expected, women consistently reported higher levels of distress and a higher proportion experienced an MDE than men.³ Interestingly, the difference between males and females across age increased for distress but diminished for MDE. However, tests for interactions between age and sex revealed that these changes were nonsignificant.

The most intriguing finding concerns the overall shape of the distribution. Unlike the findings of previous studies in the U.S., the relationship between age and depression was not U-shaped with minimum levels at age 45.^{1,2} Our data reveal that decreases in depression continued for more than 20 years, to about age 65, and increased only slightly if at all in later life comparable to those aged 55. MDE declined steadily until age 70 to 74 when it increased substantially, especially for males, but then decreased once again. Clearly, depression, measured either by distress or disorder, did not reach the high levels among the elderly that were reported in the U.S. studies.

Table II presents the effect of all sociodemographic predictors on generalized distress and MDE for males and females. The effects of age and marital status on both distress and MDE were significant for both sexes. For generalized distress, the effects of education, income adequacy, and province of residence were also significant. For MDE, marital status and income adequacy were significant for both sexes, and education was significant for females but not males. Income adequacy and immigrant status were significant for males but not females.

In order to assess whether these socioeconomic variables influenced the relationship between age and depression we performed two parallel analyses, using OLS regression for generalized distress and logistic regression for MDE (Tables III and IV respectively). To examine distress, it was necessary to account for the small upward curve in the distribution after age 65 to 69; thus, we included a squared function for age. The addition of this variable greatly increased the coefficient for age (model 2). Age and age squared remained significantly associated with distress after each of the

sociodemographic predictors (models 3 to 8) were controlled for separately. When we included all predictors (model 9), the effect of age squared on distress was eliminated, and the effect of age increased by 25% compared with model 1. Thus, once other sociodemographic variables were partialled out, the level of depression declined steadily throughout the entire life course. Models 4 and 5 indicated that marital status and income adequacy had the greatest effects on reducing the coefficient for age squared (55% and 49% proportional reductions respectively). Therefore, low income or not being married accounted for the majority of the increase in depression after age 69 observed in Figure 1. In addition, sex, marital status, income adequacy, and education were independently related to distress. With respect to region, only Quebec demonstrated significantly higher distress scores than the reference category (individuals living in BC). In fact, Quebec scores were significantly higher than those of all provinces except Manitoba. Immigrant status had no independent effect on distress.

In the logistic regression analysis, age remained negatively associated with MDE even after other variables were controlled for. In fact, the effect of age on MDE increased once we added all other variables into the equation (model 1 and 8). In the final equation, after controlling for age, women and previously married individuals were also significantly more likely to report an MDE than others. Income adequacy was no longer significant once other variables were included in the model. Finally, education, region and immigrant status had no significant effect on MDE.

DISCUSSION

The relationship between age and depression, using either a generalized distress scale or a diagnostic instrument, showed a steady decline across age groups after other sociodemographic factors were controlled for. Since this analysis is based on a synthetic cohort, we cannot say conclusively that increases in age result in lower levels of depression. Instead, older cohorts may be at a lower risk.

Notwithstanding this limitation, it appears that age is a protective mechanism for mental health independent of the effect

Figure 1. Distribution of generalized distress and major depressive episode (MDE) across age groups for males and females (N=16,692)

of other sociodemographic indicators. Thus, it is necessary to explore other factors that may account for this reduction in risk of depression across older cohorts. Previous studies have linked lifestyle factors^{32,33} and exposure to stressful experiences^{3,34-36} to depression. In addition, self-esteem, perceived mastery, and social support^{34,37} have been identified as protective mechanisms. Further research is required to investigate whether these factors account for the decline in rates of distress and MDE across age groups for Canadians.

Three possible explanations for the lack of consistent findings in the current literature on age and depression were identified. These criticisms point to issues of inade-

quate and nonrepresentative samples, differences in outcome measures, and confounding of the relationship with sex and other covariates. This analysis addressed all three issues. Using a large, nationally representative sample with an age range across the life course, we were able to examine the association between age and depression from adolescence to the older age groups (80+). We found a much different relationship between age and depression from that of other studies using nationally representative samples from the United States.^{1,2}

We examined both distress and MDE as outcomes and found the results to be quite similar. In fact, after we had partialled out other sociodemographic factors, the rela-

TABLE III
OLS Regression of Generalized Distress on Age and Other Sociodemographic Variables (n=15,493)[†]

Predictors	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Age	-0.149*	-0.399*	-0.389*	-0.269*	-0.290*	-0.353*	-0.408*	-0.405*	-0.195*
Age ²		0.256*	0.241*	0.115*	0.131*	0.187*	0.264*	0.261*	0.018
Sex			0.101*						0.087*
Single				0.060*					0.049*
Div/wid/sep				0.105*					0.067*
Income adequacy					-0.149*				-0.106*
Education						-0.088*			-0.053*
Nfld							-0.009		-0.016
PEI							-0.005		-0.007
NS							0.010		0.008
NB							0.012		0.007
Que							0.102*		0.092*
Ont							0.024		0.021
Man							0.029		0.026
Sask							-0.010		-0.014
Alta							-0.001		-0.002
Immigrant								-0.021	-0.026
	0.022	0.025	0.035	0.036	0.047	0.032	0.034	0.026	0.070

* $p \leq 0.001$

[†] Standardized OLS regression coefficients are reported.

TABLE IV
Logistic Regression of Major Depressive Episode (MDE) on Age and Other Sociodemographic Variables (n=16,271)[†]

Predictors	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Age	-0.093*	-0.097*	-0.109*	-0.092*	-0.095*	-0.093*	-0.091*	-0.106*
Sex		0.664*						0.591*
Single			0.235					0.220
Div/wid/sep			0.949*					0.796*
Income adequacy				-0.137*				-0.075
Education					-0.015			0.022
Nfld						-0.557		-0.561
PEI						-0.571		-0.555
NS						0.304		0.286
NB						-0.195		-0.212
Que						-0.247		-0.275
Ont						-0.166		-0.135
Man						0.163		0.191
Sask						-0.254		-0.258
Alta						-0.159		-0.167
Immigrant							0.174	0.248

* $p \leq 0.001$

[†] Estimated logistic regression coefficients are reported.

tionships between age and the two outcomes were both linear and negative. This contradicts previous evidence that diagnostic scales are inappropriate for the elderly because some symptoms can be confounded with old age.¹⁸ The distress measure we employed was not confounded with somatic complaints by the very nature of the six questions asked. This could possibly

explain why there was no substantial increase in distress for the elderly population and why the relationship was similar to that of MDE. However, other investigators, who decomposed their distress scales, have found that non-somatic dimensions also displayed U-shaped patterns.² We decomposed the sample by sex and found that, although it did have a significant

effect on both outcomes, its effect was independent of age. With only one exception, MDE at age 80 and over, women always reported higher rates than men for both outcomes.

It appears that the distribution of age and depression in Canada is different from that in the United States, where most of these studies have been done. The difference may

be due to the racial make-up of the sample. Although we were able to control for birth place, we were unable to investigate racial and ethnic distinctions with this public use data set. However, while others have found that ethnic origin and race were significant, the association was independent of age.¹ Further research is required to explain this Canadian-U.S. difference.

ACKNOWLEDGEMENTS

We thank Dr. William Avison, Cathy Thorpe, and two anonymous reviewers for helpful comments on previous drafts of this paper.

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Received: December 13, 1996

Accepted: June 1, 1997

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